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rence of one or more multinucleate cells at the base of certain young aecidia is considered, and the conclusion is reached "that they are sporophytic structures, and that they result from the stimulated growth which follows the sexual cell fusions." This is opposed to the idea (CHRISTMAN) that the "fusion cell" functions at once as a "basal cell" at the bottom of each row of spores.—J. M. C.

Gnetales and Angiosperms.—Last year ARBER and PARKIN announced¹⁴ their "strobilus theory of angiospermous descent;" and now they have applied it to the interpretation of the relationships of Gnetales.¹⁵ There is much to commend their general view, without conceding all the details cited; in fact the reviewer has long since reached the same conclusions as to the character of the strobilus of Gnetales, and has remarked upon its similarity to such inflorescences as those of the Amentiferae. The authors do not regard the Gnetales as a modern group, although at present unknown as fossils. The three survivors of this ancient group have "pro-anthostrobili,"¹⁶ evident in the staminate "flower" of *Tumboa* and reduced in the other "flowers" of the group by the suppression of one set of sporangia. To the authors the strobilus of this group is the so-called "flower;" and the strobilus of current terminology is an aggregate of strobili. Based upon this strobilus situation, the authors regard Gnetales as a phylum of gymnosperms having a common ancestry with angiosperms in the hypothetical "hemiangiosperms," and in many respects following parallel lines of development.—J. M. C.

Origin of angiosperms.—LIGNIER¹⁷ has discussed the recent paper by ARBER and PARKIN,¹⁸ in which the origin of the angiosperm flower (of the *Ranales* type) is traced to the bisporangiate strobilus of *Bennettitales*. From this view LIGNIER dissents, as he regards the strobilus in question as representing an inflorescence rather than a flower. To him the intraseminal scales are not sterile carpels or sterile lobes of carpels, but bracts in whose axils the ovuliferous stalks appear. This strobilus, therefore, is a compound one, as are the ovulate strobili of many of the *Coniferales* and both strobili of the *Gnetales*. LIGNIER agrees to the idea that the *Ranales* type of flower is the most primitive, but he would derive it from

¹⁴ Review in *BOT. GAZETTE* 44:389. 1907.

¹⁵ ARBER, E. A. NEWELL, AND PARKIN, JOHN, Studies in the evolution of the angiosperms. The relationship of the angiosperms to the Gnetales. *Annals of Botany* 22:489-515. 1908.

¹⁶ An "anthostrobilus" is an axis bearing microsporophylls and megasporophylls, with the latter above the former. A "pro-anthostrobilus" is the variety in which the pollen reaches the ovules (gymnosperm), the strobilus of *Bennettitales* being an example; while a "eu-anthostrobilus" is the variety in which the pollen is received by the megasporophyll (angiosperm).

¹⁷ LIGNIER, O., Le fruit des *Bennettitées* et l'ascendance des Angiospermes. *Bull. Soc. Bot. France* IV. 8:1-17. 1908.

¹⁸ *BOT. GAZETTE* 44:389. 1907.

the earlier cycadophyte stock. Accordingly he introduces before ARBER and PARKIN's "pro-anthostrobilus" an evolutionary stage characterized by the grouping of filicinean microsporophylls and megasporophylls in monosporangiate strobili, and to this hypothetical stage he gives the name "pteridostrobilus." This stage was temporarily a common one for the general cycad and angiosperm phyla; and at this stage the cycads practically stopped, with reduction of sporophylls; while the angiosperm phylum proceeded to the establishment of the bisporangiate condition, the evolution of angiospermy, the transformation of the habit of the vegetative body, etc. According to LIGNIER, the Bennettitales represent a different phylum, which branched from the cycadophyte phylum after the angiosperms, but still at the pteridostrobilus stage.—J. M. C.

Nitrogen fixing bacteria.—In a short preliminary paper¹⁹ BREDEMANN summarizes the conclusions deduced from his study of nitrogen fixing bacteria of the Clostridium type. Eleven cultures of the so-called "species" of various authors were compared with sixteen types isolated by himself. These types were from many sources, particularly soil from different parts of the world. A comparison of these forms cultivated under proper conditions for considerable periods has convinced him that all must be considered as a single species, the *Bacillus amylobacter* A. M. et Bredemann. Some characters, such as size of spores, motility, and development on culture media, are quite constant; others, as the ability to ferment nitrogen free solutions, are variable. Indeed, the variability of subcultures from a single stock may be made, by appropriate methods, to exceed the differences among the various so-called species and races. Most important, perhaps, are his conclusions relative to variation in nitrogen fixing power. Old cultures which had completely lost this capacity regained it when grown for a time in soil properly sterilized. This ability to fix nitrogen is closely correlated with that of fermenting nitrogen free solutions, and varies as greatly among various subcultures from a single stock as among those types that have been described as different species. Continued cultivation brings loss of power to fix nitrogen, but this power may be regained by appropriate culture methods.—R. E. BUCHANAN.

Variations of sexual organs of Saprolegnia.—KAUFFMAN²⁰ has obtained some extremely interesting results from some unusually guarded cultures of the Saprolegniaceae. He has found it possible to isolate species of Saprolegnia quickly by means of a single zoospore, and such pure cultures were used in his experiments. A great variety of solutions was used, but the best substances to

¹⁹ BREDEMANN, G., Regeneration der Fähigkeit zur Assimilation von freien Stickstoff des *Bacillus amylobacter* A. M. et Bredemann und der zu dieser Spezies gehörenden bisher als Granulobacter, Clostridium usw. bezeichnete anaeroben Bakterien (Vorläufige Mitteilung). Ber. Deutsch. Bot. Gesell. **26a**:362-368. 1908.

²⁰ KAUFFMAN, C. H., A contribution to the physiology of the Saprolegniaceae, with special reference to the variations of the sexual organs. Annals of Botany **22**: 361-388. pl. 23. 1908.